

REMARKS

Favorable reconsideration of this Application and the Office Action of May 3, 2006 are respectfully requested in view of the following remarks.

Claims 1 to 28 appear in this application. The claims are those listed in the Amendment Response filed October 4/5, 2005. Claims 13 to 26 and 28 stand withdrawn from consideration under 37 CFR 1,142(b) as being directed to the non-elected invention.

It is noted that this Office Action is a Final rejection. Making this Office Action a Final rejection is totally improper for the following reason. In this Office Action claim 7 is rejected for a first time over Koito et al. (US 2003/0130147) in view of Hara et al. (US 2002/0128164). As stated in paragraph 4 of the Remarks section of Applicant's previous Response filed February 14, 2006 claim 7 was not rejected on this prior art. Now for the first time claim 7 is so rejected. Therefore, it was improper for the USPTO to make this May 3, 2006 Office Action a final rejection and, therefore, the USPTO is respectfully requested to reconsider and withdraw the erroneously stated finality of the May 3, 2006 Office Action.

The rejection of claims 1-4, 8-11 and 27 over Koito et al. (US 2003/0130147) under 35 U.S.C. 103, and claims 5, 6 and 12 under 35 U.S.C. 103 over Koito et al. (US 2003/0130147) in view of Hara et al. (US 2002/0128164) are both respectfully traversed.

It is submitted that a proper and complete understanding of the context of the present invention clearly shows the unobvious and patentable nature of the cleaning compositions of this invention. As microelectronic device fabrication has advanced certain new problems have developed. Due to issues with electrical performance and reliability in mass production, a variety of metal stacks are utilized for forming gate lines in FPD technology. Multiple metal layers such as Mo/AlNd/Mo, and especially double layers such as Mo/AlNd, AlNd/Ti, and AlNd/Cr are common for gate line metal stacks in current

manufacturing of FPD technologies. However, in stacks where the AlNd alloy is located beneath another metal, aluminum corrosion during the rinse step can be a critical problem for electrical performance. This corrosion is commonly known as overhang and can create voids that weaken the metal structure. Loss of aluminum to corrosion during the chemical cleaning or water rinse steps can also create notching in the metal lines, which is a most common defect at FPD technology. The composition of the cleaning solution and its behavior in water plays a key role in causing corrosion. A typical photoresist remover for FPD applications might include polar organic solvents blended with organic amines and other solvating agents. Amines have been shown to increase the effectiveness of photoresist removal in solvent blends. However, the water rinse following use of this type of cleaner or remover can create a strongly alkaline aqueous solution and that can lead to considerable loss of metal from the patterned lines. This necessitates an intermediate rinse between the cleaning/stripping step and the aqueous rinse. Such an intermediate rinse, typically with isopropyl alcohol, adds undesirable time, safety concerns, environmental consequences, and cost to the manufacturing process. Thus, there was a need for a **non-aqueous** alkaline-containing stripping and cleaning compositions for photoresists that enable one to completely remove both photoresist and etch and/or ash residue from the microelectronic substrate **yet not produce any significant metal (aluminum) corrosion during a subsequent aqueous rinse step**, especially for FPD microelectronic elements.

As stated in Applicant's previous response, the present invention addressed this problem and need for a **non-aqueous** cleaner/stripper/remover that would not produce such undesirable **aluminum** corrosion in a subsequent aqueous rinse and not require any intermediate rinse. The problem is addressed by the **non-aqueous** cleaning compositions of the present invention.

Applicant's claims are directed to a **non-aqueous** composition for cleaning microelectronic substrates that comprises:

the following components:

- (a) a nucleophilic amine,
- (b) a moderate to weak acid having a strength expressed as a "pKa" for the dissociation constant in aqueous solution of from about 1.2 to about 8,
- (c) a compound selected from the group consisting of an aliphatic alcohol, diol, polyol or glycol ether, and
- (d) an organic co-solvent,

and the weak acid component (b) is present in the composition in an amount such that the equivalent mole ratio of acid/amine is greater than .75 and the pH of the composition is from about pH 4.5 to 9.5.

The previous Office Action admitted (page 5, last paragraph) that the Koito et al. disclosure does "not teach, with sufficient specificity, a composition having the specific pH containing a nucleophilic amine, a moderate to weak acid, a glycol ether, a co-solvent, and the other requisite components of the composition in the specific proportions as recited by the instant claims."

Despite these glaring deficiencies in the reference disclosure, the PTO still rejects the claims over the Koito et al. disclosure on the unsupported basis that all these deficiencies in the Koito et al. reference disclosure is simply cured by "**the broad teachings of Koito**" would make the modification obvious to one skilled in the art. The PTO must read the disclosure of Koito et al in context, not merely try to extract some **broad contention therefrom merely to attempt to meet applicant's invention.** Clearly, the PTO only makes this contention on the basis of having read Applicant's disclosure since absolutely nothing except the hindsight of Applicant's disclosure suggests all these criteria in common. However, the specific suggestion for all such parameters to be selected and met must come from the teaching in the prior art, without hindsight reference to Applicant's disclosure. Such hindsight reconstruction of the prior art is improper and renders this rejection erroneous.

Moreover, the compositions of Koito et al. are intended for use in copper-containing

substrates, whereas, is apparent from Applicant's disclosure, Applicant's compositions are intended for use against aluminum-containing substrates. These different substrates have differing strippability and non-corrosion requirements and, therefore, it is not possible to extrapolate the teaching of composition intended for copper (Koito et al.) to compositions intended for aluminum (Applicant's). In the May 3rd Office Action the PTO, in the RESPONSE TO ARGUMENTS section, dismisses the argument about strippability of aluminum substrates vs copper substrates on the basis that composition claims do not recite "for cleaning aluminum-containing substrates", and even if they did, that would be an intended use and not a patentable limitation. The claims do not need to recite that limitation since they are composition claims. Moreover, this PTO contention completely misses the point and significance of Applicant's argument. While recitation of such a limitation in a composition claims is an intended use recitation and not a per se limitation on the composition, the novel and unobvious properties of the claimed composition when employed for cleaning aluminum-containing substrates provides novel and unobvious properties to the claimed composition. It is elementary that properties of compounds or composition must be considered in determining the patentability thereof. This has been elementary patent law since the case of *In re Papesch*, 315 F.2d 381, 137 USPQ 43, 50 (CCPA 1963). Thus, the fact that the **claimed non-aqueous compositions** are able to produce the unexpected, herein before described results in cleaning aluminum-containing substrates provides nonobvious and patentable status to the claimed compositions and the USPTO dismissal of those arguments is clearly erroneous since such properties must be considered in determining the patentability of the claimed compositions.

Therefore, in view of the foregoing, the USPTO is respectfully requested to reconsider and withdraw the rejection of claims 1-4, 8-11 and 27 are rejected over Koito et al. (US 2003/0130147) under 35 U.S.C. 103.

It is further to be noted that Applicant's claimed compositions are **non-aqueous compositions**. Koito et al. does not specifically state that their composition may be non-aqueous. The USPTO had tried to imply that paragraph 0082 suggest that the Koito et al.

compositions do not need water in the compositions. However, the specific disclosure in Koito et al. suggests just the opposite. Every specific composition disclosed in the examples in Koito et al. contains water. There is no disclosure of any composition without water. Moreover, even more pertinent is the fact that the specific compositions illustrated in Koito et al. clearly show that when there is little water in their compositions the compositions do not provide suitable strippability. See Table 1, agent # 5 and table 2, agents # 12 and # 13 containing 4% water. Their strippability is an unacceptable "C". i.e., "damage observed". See also Table 8, agent # 24 with only 1% water, where film damage is rated "D", i.e., "damage was significant". Thus, for this reason, the Koito et al disclosure cannot teach a **non-aqueous** composition, and particularly a **non-aqueous composition meeting all the other parameters and requirements of Applicant's claims.**

The May 3rd Office Action, in the RESPONSE TO ARGUMENTS section, also attempts to dismiss argument of Applicant by stating "The Examiner maintains that the damage which occurred to the substrates as shown in the examples of Koito et al was not attributed to the amount of water used but to various mixtures of different alkanolamines and corrosion inhibitors." Such a contention is totally contrary to the evidence in Koito et al. The same mixtures of alkanolamines and corrosion inhibitors with very large amounts of water do not display the damage to substrates. The only true conclusion that can be reached is that the amount of water that is low in the compositions off Koito et al produce damage to the substrates, whereas the non-aqueous compositions of the present invention do not produce such damage to the aluminum-containing substrates to be cleaned. This unexpected property of the claimed cleaning compositions provides unobvious and patentable merit to the claimed compositions.

Therefore, for this further reason the USPTO is respectfully requested to reconsider and withdraw the rejection of claims 1-4, 8-11 and 27 over Koito et al. (US 2003/0130147) under 35 U.S.C. 103.

The rejection of claims 5, 6,7 and 12 under 35 U.S.C. 103 over Koito et al. (US

2003/0130147) in view of Hara et al. (US 2002/0128164) is likewise respectfully traversed. The deficiencies of the Koito et al. disclosure, as discussed herein before, are not cured by Hara et al. and this Section 103 rejection of claim 5, 6, 7 and 12 is also erroneous for the same reasons, and its withdrawal is respectfully requested.

Moreover, as stated in Applicant's previous Response, the compositions of Hara et al. are completely different types of compositions than those of Koito et al. and the two teachings are not combinable. The PTO has erroneously dismissed this contention, in the RESPONSE TO ARGUMENTS section of the February 14, 2006 response, on the grounds that Koito et al. and Hara et al. are in "the same general field of endeavor, namely cleaning semiconductor substrates". This completely overlooks and erroneously dismisses the fact that in the field of microelectronic strippers not all microelectronic stripping compositions operate the same way **and those that operate by different mechanisms prevent their teachings from being combined (combined out of context as is attempted to be done by the PTO in formulating this rejection)**. The PTO has not answered this factual reality. The compositions disclosed in the Hara et al. document are entirely different than the compositions of Koito et al. and also of the present invention. The compositions of Hara et al. are **aqueous compositions that must contain a peroxide oxidizing agent and a quaternary ammonium salt**, neither of which is employed in Applicant's **non-aqueous** compositions. The peroxide-containing (oxidizer-containing) compositions of Hara et al. are compositions that have a cleaning mechanism that is completely different from the compositions of Koito et al. and from the compositions of Applicant's invention and thus operate in a different cleaning mechanism. Therefore, any teaching of equivalency of components in the differently operating compositions of Hara et al. cannot be extrapolated to any kind of equivalency in a completely different composition of Koito et al. or for that matter in the different compositions of the present claims, that have a completely different cleaning mechanism because of the different type of compositions involved. Thus, the reliance on Hara et al. to show some alleged equivalency is clearly erroneous, making the rejection of Applicant's claims erroneous, and the PTO is respectfully requested to reconsider and withdraw the rejection of claims 5, 6 7 and 12

under Section 103 over Koito et al. in view of Hara et al.

Furthermore, Hara et al. fail to disclose that the cleaning compositions **must** contain a nucleophilic amine, a moderate to weak acid having a strength expressed as a “pKa” for the dissociation constant in aqueous solution of from about 1.2 to about 8, a compound selected from the group consisting of an aliphatic alcohol, diol, polyol or glycol ether, and an organic co-solvent, and the weak acid component (b) must be present in the composition in an amount such that the equivalent mole ratio of acid/amine is greater than .75 and that the composition has a pH of from about 4.5 to 9.5. No such composition is disclosed, taught or even remotely suggested by the disclosure in Hara et al.

Hara et al. only optionally has an amine component. The acid component in Hara et al. is also optional and only as a corrosion inhibitor, not as a neutralizer for a nucleophilic amine component. Nothing in Hara et al teaches that both these “optional” components must both be present and that a moderate to weak acid of pKa of about 1.2 to about 1.8 must be employed when a nucleophilic amine is employed and that the acid must be present in the composition in an amount such that the equivalent ration of acid/amine is greater than 0.75 and that the composition has a pH of from about 4.5 to 9.5.

Furthermore, when one looks at what Hara et al. actually disclose, the differences from the present invention become even more apparent. Every example of a composition of Hara et al. is an **aqueous composition having a very significant amount of water**. In Table 1 the amount of water in the compositions ranges from 60 to 90%, in Table 2 the amount of water ranges from 25 to 90%; and in Table 3 the water ranges from 55 to 90 %. In contrast, Applicant’s claimed compositions are non-aqueous compositions. Nothing in Hara et al. teaches one to eliminate the water and provide a non-aqueous composition, nor to eliminate the absolutely critical peroxide or quaternary ammonium salt components of Hara et al.

Additionally, the second previous (August 25, 2005) Office Action, in the paragraph

bridging pages 4 and 5 of that Action, the PTO recognized and correctly stated that that Hara et al. does not "teach a composition containing the specific amount of acid (corrosion inhibitor) or teach, with sufficient specificity a composition having a specific pH containing a nucleophilic amine, a moderate to weak acid, a glycol ether, a cosolvent, and the other requisite components of the compositions in the specific proportions as recited by the instant claims." It might also be added that Hara et al. fails to require a non-aqueous composition, and in fact, teaches away from such a composition.

Therefore, the USPTO is respectfully requested to reconsider and withdraw the rejection of claims 5, 6, 7 and 12 under 35 U.S.C. 103 over Koito et al. (US 2003/0130147) in view of Hara et al. (US 2002/0128164).

After withdrawal of these rejections Applicant request rejoinder of claims 13 to 26 and 28 with claims 1 to 12 and 27, per *In re Ochiai*, 71 F. 3d 1565, 37 USPQ2d 1127 (Fed. Cir. 1995).

It is respectfully submitted that the foregoing is a full and complete response to the Office Action and that all the claims are allowable for at least the reasons indicated. An early indication of their allowability by issuance of a Notice of Allowance is earnestly solicited.

Respectfully submitted,



George W. Rauchfuss, Jr., Esq.
Registration No. 24,459
Attorney for Applicant(s)
Ohlandt, Greeley, Ruggiero & Perle, L.L.P.
One Landmark Square, 10th floor
Stamford, CT 06901-2682
Tel: (203) 327-4500
Fax: (203) 327-6401

Date: June 30, 2006